

Soils in India



Soil

- Soil is the topmost layer of the continental crust having weathered particles of rocks. The soils of India are the product of physical factors as well as human factors.
- Soil can be simply defined as a mixture of small rock particles/debris and organic materials/ humus which develop on the earth's surface and support the growth of plants.

Soil Classification

- In India, soil had been classified from the ancient period itself even though it was not as detail as the modern classifications.
- In the ancient period, the classification was based on only two things; whether the soil is fertile or sterile. Thus the classification were:
 - Urvara [fertile]
 - Usara [sterile]

Types of Soil

- The first scientific classification of soil was done by Vasily Dokuchaev. In India, the Indian Council of Agricultural Research (ICAR) has classified soils into 8 categories.
- Alluvial Soil
- Black Cotton Soil
- Red Soil
- Laterite Soil
- Mountainous or Forest Soils
- Arid or Desert Soil
- Saline and Alkaline Soil
- Peaty, and Marshy Soil/Bog Soil

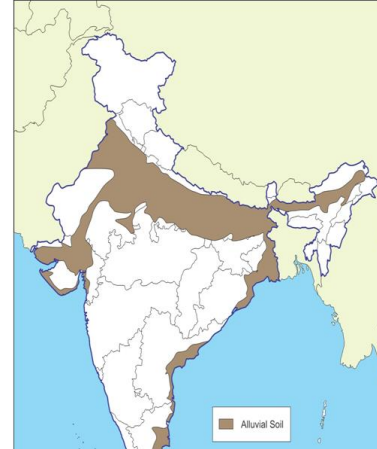
Alluvial soil

- Formation: They are mainly derived from the debris brought down from the Himalayas or the silt left out by the retreating sea. Thus they are azonal soils.
- They are the largest soil group covering about 15 lakh sq km or about 46 percent of the total area.
- They support more than 40% of India's population by providing the most productive agricultural lands.

Silt: fine sand, clay, or other material carried by running water and deposited as a sediment, especially in a channel

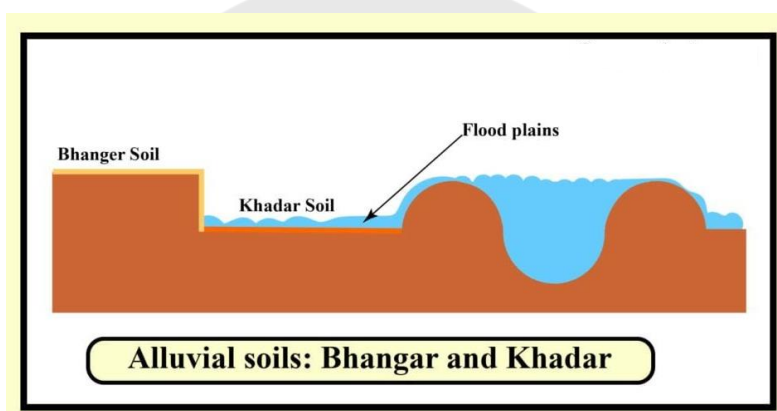
Distribution of Alluvial Soils in India

- They occur all along the Indo-Gangetic-Brahmaputra plains except in few places where the top layer is covered by desert sand.
- They also occur in deltas of the Mahanadi, the Godavari, the Krishna, and the Cauvery, where they are called deltaic alluvium (coastal alluvium)
- Some alluvial soils are found in the Narmada, Tapi valleys, and Northern parts of Gujarat.



Geological divisions of alluvial soils

- Geologically, the alluvium of the Great plain of India is divided into newer or younger khadar and older bhanger soils.



Bhanger

- The Bhanger is the older alluvium along the river beds forming terraces higher than the flood plain (about 30 meters above the flood level).
- It is of a more clayey composition and is generally dark-colored.
- A few meters below the terrace of the bhanger are beds of lime nodules known as "Kankar".

Khadar

- The Khadar is composed of newer alluvium and forms the flood plains along the river banks.
- The banks are flooded almost every year and a new layer of alluvium is deposited with every flood. This makes them the most fertile soils of the Ganges.

Chemical properties of Alluvial Soils

- Alluvial soils of the northern plains → transported soils →, therefore, lack humus → lack nitrogen [That is why we need to use nitrogenous fertilisers in the northern plains!]. Exception: the Ganga-Brahmaputra delta region is rich in humus.
- These soils lack in nitrogen, phosphorus and humus. However, they are generally rich in potash and lime.
- Suitable Crops: Wheat, rice, maize, sugarcane, pulses, oilseeds, fruits and vegetables, leguminous crops.

Alluvial regions with rainfall

- Above 100cm – Suitable for paddy
- B/w 50-100cm – Suitable for wheat, sugarcane, tobacco, and cotton
- Below 50cm– Course grains (millets)

Black Soil

- These soils are locally known as the 'Regur Soil' or the 'Black Cotton Soil'. Internationally, these are known as 'tropical chernozems'. These soils are famous for the cultivation of cotton.
- The parent material for most of the black soil are the volcanic rocks that were formed in the Deccan Plateau (Deccan and the Rajmahal trap).
- Black colour is ordained by titani-ferrous magnetic compounds found in basalt.
- These soils are black in colour due to the presence of iron, aluminium compounds and humus.

Area

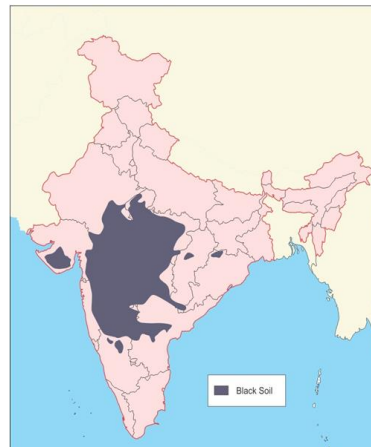
- These are found in the Deccan trap region. Black soil covers most of the Deccan Plateau which include parts of:
- Maharashtra,
- Madhya Pradesh,
- Gujarat,
- Andhra Pradesh and some parts of
- Tamil Nadu.

Other Characteristic Features

- These soils are rich in minerals and known for their fertility.
- The soil depth varies from place to place. It is very thick in lowlands but very thin on highlands. Also, in the upper reaches of the Godavari and the Krishna, and the northwestern part of the Deccan Plateau, the black soil is very deep.
- These soils swell and become sticky when wet and develop deep wide cracks when dry. This helps in self-aeration, which leads to the absorption of nitrogen from the atmosphere. Thus, there occurs a kind of 'self ploughing'.
- This aeration and oxidisation to deep levels contribute to the maintenance of the fertility of these soils. This continued fertility is favourable in the area of low rainfall for cotton cultivation even without irrigation.
- Due to slow absorption and loss of moisture, the black soil retains the moisture for a very long time, which helps the crops, especially, the rain-fed ones, to sustain even during the dry season.
- Chemically, the black soils are rich in lime, iron, magnesia and alumina. They also contain potash. But they lack in phosphorous, nitrogen and organic matter.

Suitable Crops

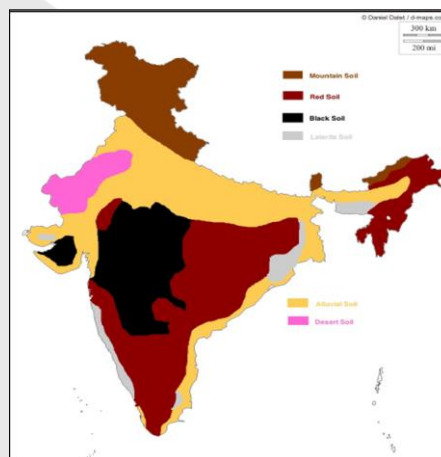
- These soils are highly productive and well suited to the cultivation of cotton, pulses, millets, linseed, tobacco, sugarcane, vegetables and citrus fruits.



Red and Yellow Soils

Loamy: a rich, friable soil containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

- Locally called 'Chalka' in Andhra Pradesh.
- Formation: These are derived from granites, gneisses and other metamorphic rocks → Zonal Soils. These are formed under well-drained conditions.
- The presence of ferric oxides makes the colour of soil red, ferric oxides occurring as thin coatings on the soil particles.
- The top layer of the soil is red and the horizon below is yellowish.
- Extent – 18.5 % of the area
- Texture: Sandy to clay and loamy.



Area

- This soil is also known as the omnibus group.
- Rainfall is highly variable. Thus, the soil has developed 3 subtypes
- Red & Yellow soil – rainfall is 200cm – NE India – Nagaland, Mizoram, Manipur Hills, parts of Malabar coast, quick drainage is needed
- Red Sandy Soil – Drier plateaus like Karnataka, TN, Telangana, Rayalseema – rainfall from 40-60cm
- RedAlluvial Soil – Along river valleys – has good fertility

Chemical Composition of Red Soils

- Generally, these soils are deficient in phosphate, lime, magnesia, humus and nitrogen.
- Rich in iron and potash
- These soils are airy and need irrigation for cultivation.
- Suitable Crops: In places where irrigation facilities are available, the crops cultivated are wheat, cotton, pulses, tobacco, millets, oilseeds, potato, maize, groundnut

Laterite Soil

Leaching: chemical or mineral drain away from soil, ash, or similar material by the action of percolating liquid, especially rainwater

- The word laterite has been derived from the Latin word 'Later' which means brick. These soils when wet are as soft as butter but become hard and cloddy on drying. Therefore, these are widely cut as bricks for use in house construction.
- In the areas of high temperature and high rainfall.
- Formed as a result of high leaching.
- Lime and silica will be leached away from the soil.
- Organic matters of the soil will be removed fast by the bacteria as it is high temperature and humus will be taken quickly by the trees and other plants. Thus, humus content is low.

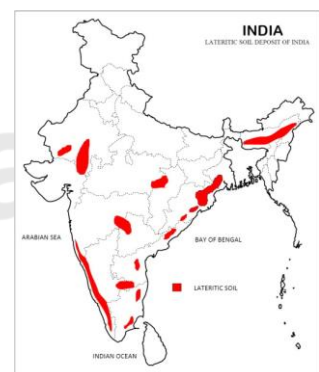
Area

- Rich in: Iron and Aluminum
- Deficient in: Nitrogen, Potash, Potassium, Lime, Humus
- Colour: Red colour due to iron oxide.
- These soils have mainly developed in the higher areas of the Peninsular plateau. The laterite soils are commonly found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh and the hilly areas of Orissa and Assam.
- These soils represent the end product of decomposition and are generally low in fertility.
- The pebbly crust is the important feature of laterites which is formed due to alteration of wet and dry periods.
- These soils are acidic in character due to leaching. Application of manures and fertilisers is required for making these soils fertile for cultivation.



Cultivation

- It is famous for crops like groundnut, cashew nut, etc.
- Laterite soil of Karnataka is given to coffee, rubber, and spices farming.

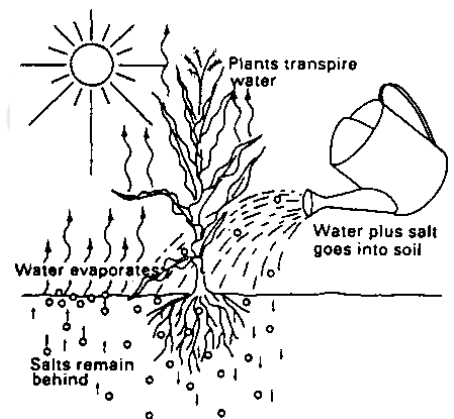


Desert / arid soil

- This soil is deposited by wind action and mainly found in the arid and semi-arid areas like Rajasthan, West of the Aravallis, Northern Gujarat, Saurashtra, Kachchh, Western parts of Haryana, and southern part of Punjab.
- It lacks in moisture content. Humus content is less, and Nitrogen is originally low but some of it is available in the form of nitrates.
- They are sandy with low organic matter. Living microorganisms are low in content
- High salt content.
- Lack of moisture and Humus.
- Kankar or Impure Calcium carbonate content is high which restricts the infiltration of water.
- Nitrogen is insufficient and Phosphate is normal.
- If irrigated this soil gives a high agricultural return.
- These are suitable for less water-intensive crops like Bajra, pulses, fodder, and guar.

Saline and Alkaline Soils

- They are also known as Usara soils. Various local names for saline soils are Reh, Kallar, and Chopan, Rakar, Thur, Karl etc.
- Alkali soil contains a large content of NaCl
- The soil is infertile
- These soils have developed in areas with dry climatic conditions (in areas having a little more rainfall than the areas of desert soils) accompanied by lack of proper drainage. In this situation, salts of sodium, calcium and magnesium are deposited on the upper layer of the soil by capillary action.
- These are mainly found in Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar, and Maharashtra.
- Sodium chloride and sodium sulphate are present in this soil. It is suitable for leguminous crops.
- **Salinization** also occurs because of over-irrigation (canal irrigation/groundwater use) and in areas of the high water table (as in the coastal areas of Maharashtra and Tamil Nadu). Salinity from irrigation can occur over time wherever irrigation occurs. This is because almost all water (even natural rainfall) contains some dissolved salts. When the plants use the water, the salts are left behind in the soil and eventually begin to accumulate. Also, excessive irrigation with dry climatic conditions promotes capillary action, which results in the deposition of salt on the top layer of the soil



Peaty, and Marshy Soil/Bog Soil

- These soils are locally called Kari in Kottayam and Alleppey districts of Kerala.
- Formation: These are marshy soils and are a result of waterlogging and anaerobic conditions (which leads to partial decomposition of organic matter).
- Areas: They are found in the areas of heavy rainfall and high humidity, where there is a good growth of vegetation. It occurs widely in the northern part of Bihar, the southern part of Uttaranchal and the coastal areas of West Bengal, Orissa and Tamil Nadu.
- Rich in moisture content but at the same time, greater content of salt and every day inundation by high tide has made it infertile soil
- No organic activity due to excessive moisture content
- It is characteristic of the delta region of India
- Significance – Over Bengal delta, it is suitable for jute and rice, and over Malabar, it is suitable for spices, rubber, big sized rice
- It has to some extent been favorable to the Mangrove forests of India.

Forest Soil/ Mountain Soil

- It is principally found on mountains with steeper slopes
- It is rich in organic content – humus content is also adequate but other nutrients are deficient
- It is a loamy soil when sand, silt, and clay are in mixed form
- These soils are poor in potash, phosphorus and lime.
- Soil erosion is a major problem in these areas.
- These are found in the forest areas of Himalayas, Sahyadris, Eastern Ghats and terai region.
- Significance – It is very helpful to those crops which need favourable air and water drainage which is provided by this soil by virtue of being on slopes
- Generally used for rubber plantation, bamboo plantation and also tea, coffee, and fruits farming
- Large area also given to shifting agriculture where the soil fertility deteriorates after 2-3 years

Problems of Indian Soils

- Indian soils have been used for cultivation for hundreds of years and have lost much of their fertility.
- Indian soils are largely deficient in nitrogen, mineral salts, humus and other organic materials.
- Soil erosion (Himalayan region, Chambal Ravines, etc.)
- desertification (around Thar desert, rain-shadow regions like parts of Karnataka, Telangana, etc.)

Desertification :the process by which fertile land becomes desert, typically as a result of drought, deforestation, or inappropriate agriculture.

Problems

- salinity, and alkalinity (excessively irrigated regions of Punjab, Haryana, Karnataka, etc.)
- overexploitation of soils due to increase in population and rise in living standards and encroachment of agricultural land due to urban and transport development.
- waterlogging (Punjab-Haryana plain)

The excess water inhibits gaseous exchange with the atmosphere, and biological activity uses up available oxygen in the soil air and water – also called anaerobiosis, anoxia or oxygen deficiency

Distribution of Soils in %

Alluvial Soil:- 42 %

Black Soil:- 15 %

Red Soil:- 25 %

Laterite Soil:- 4.5 %

Mountain Soil:- 8 %

Desert Soil:- 5 %

Parcham Classes

Questions

To which group does the black cotton soil of India belong?

- (a) Laterite
- (b) Podzol
- (c) Chemozem
- (d) Alluvial

Which of the following soil have the attributes of cracks and shrinks in dry condition?

- A. Black clay soil
- B. Red porous soil
- C. Sandy soil
- D. Loamy soil

Consider the following statement(s) related to Regur soils or Black cotton soils.

- I. It is formed by solidification of lava spread over large area of Deccan plateau.
- II. They are very rich in minerals contents because these soils were formed due to volcanic activities.
- III. They are found in Karnataka, Maharashtra, MP, Gujarat, AP and Tamil Nadu.

Which of the above statement(s) is/are correct?

- A. Only I
- B. Only II
- C. Both I and II
- D. I, II, III

Which of the following soils is very hard to cultivate?

- A. Alluvial
- B. Black
- C. Red
- D. Sandy

The lower Gangetic plain is characterized by humid climate with high temperature throughout the year. Which one among the following pairs of crops is most suitable for this region?

- A. Paddy and Cottort
- B. Wheat and Jute
- C. Paddy and Jute
- D. Wheat and Cotton

The transfer of minerals from top soil to subsoil through soil water is called _____

- A. Percolation
- B. Conduction
- C. Leaching
- D. Transpiration

Under which climatic conditions do the laterite soils develop ?

- A. Wet tropical Climate
- B. Hot and dry Climate
- C. Cold temperature Climate
- D. Mediterranean type of Climate

Fertility of soil can be improved by _____

- A. Adding living earthworms
- B. Adding dead earthworms
- C. Removing dead earthworms
- D. Removing living earthworms and adding dead earthworms

Science dealing with study of soil is called

- A. Pedology
- B. Pedagogy
- C. Ecology
- D. Pomology

The soil which is a mixture of sand, clay and silt is known as _____

- A. Loamy soil
- B. Sandy soil
- C. Clayey soil
- D. Desert soil

Answers

1-c

2-A

3-D

4-D

5-C

6-C

7-A

8-A

9-A

10-A



Parcham Classes